Project Abstract

The Dynamics of Rules in Commons Dilemmas
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Various social sciences have contributed to understanding how humans make decisions in a given rule set of experimental games, such as social dilemmas, coordination, and bargaining. However, the rules of the games are not fixed in real-life settings. Not many systematic studies have been performed on the question of how humans are able to change the rules in commons dilemmas. From field studies it is well known that people invest significant effort in crafting new rules. This project will study what causes individuals to invest in rule development, and which cognitive processes explain the ability of humans to craft new rules.

The main research combines experiments and modeling. We use three types of experiments which we will discuss briefly:

- **Laboratory experiments**. We are developing an artificial environment where a group of 5 human subjects share a renewable resource (Figure 1). The human subjects can derive monetary rewards by collecting tokens by moving their agents around on the screen. We have a number of different treatments. In one of them the subjects can vote on a restriction on their harvesting opportunities by allocating private properties. In the other treatments the private property rule is imposed, or there is no opportunity to include private property. Those who break the rule have a chance to be caught and pay a penalty. We will test a number of effects including the impact of experience on the behavior of the subjects, and whether imposed rules lead to different behavior than chosen rules.

- **Field experiments**. Paper and pencil experiments are designed for the field in Colombia and Thailand. We design three types of games related to the resources irrigation (how much to contribute to a public good and how to allocate the public good), forest (how much to take from a renewable resource), and fisheries (when to harvest where). We test these three types of games in three types of communities: irrigation dominated, fishery dominated, and forestry dominated. The subjects can make choices which type of rule (lottery type, rotation type or property rights). We

are interested which type of rule communities chose, whether this relates to their own experience with governance, and the difference between imposed and chosen rules.

For both laboratory and field experiments we will develop agent-based models and test on the data which type of behavioral models best explain the data.

- **Role games**. The field experiments provide a starting-point to perform a companion modeling exercise. This mean that specific queries on rule crafting for each community is used to perform role games to solicit more understanding how the particular communities develop and adapt institutional rules. The resulting models are socially validated by the communities.

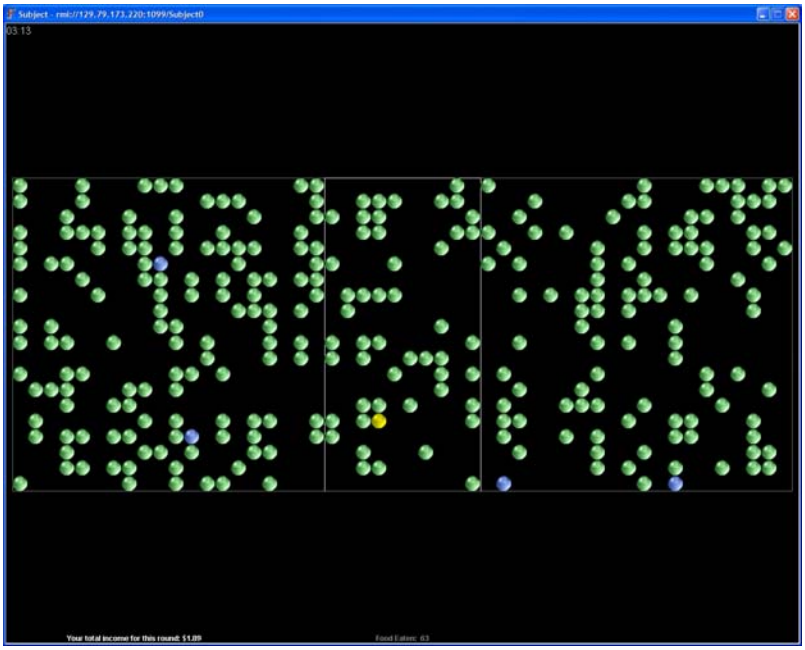

Figure 1: A screenshot from the experimental environment. The green tokens are resources, the yellow dot is the agent of the human subjects, while the blue dots are the other subjects. The white lines define the property boundaries of the yellow agent.

The different types of experiments and modeling relate to each other (Figure 2). Different types of experiments have different level of control. During the first year of the project we focused on the design of the experiments due to these differences, and to increase the likelihood that the different activities have synergetic effects. The main bottleneck we faced were the different traditions in doing experiments and role games, which led to discussions which path to follow when we want to align the different types of activities. For example, the role of subject payments was an important concern. We decided to use monetary incentives, but for some communities in the field we may decide not to pay subjects in monetary units — but in other valuable assets — if monetary units have no meaning for the subjects. The designs of the experiments provide us the opportunity to test and compare the results of different levels of control and context. Laboratory experiments provide detailed information of many real time decisions. Experiments in the field

provide less control but include some context of real resource users. In the role games the focus is on the context of the particular communities. Due to the different focuses we aim to develop a number of models that are consistent to each other and provide some core findings how people invest in rule creation.

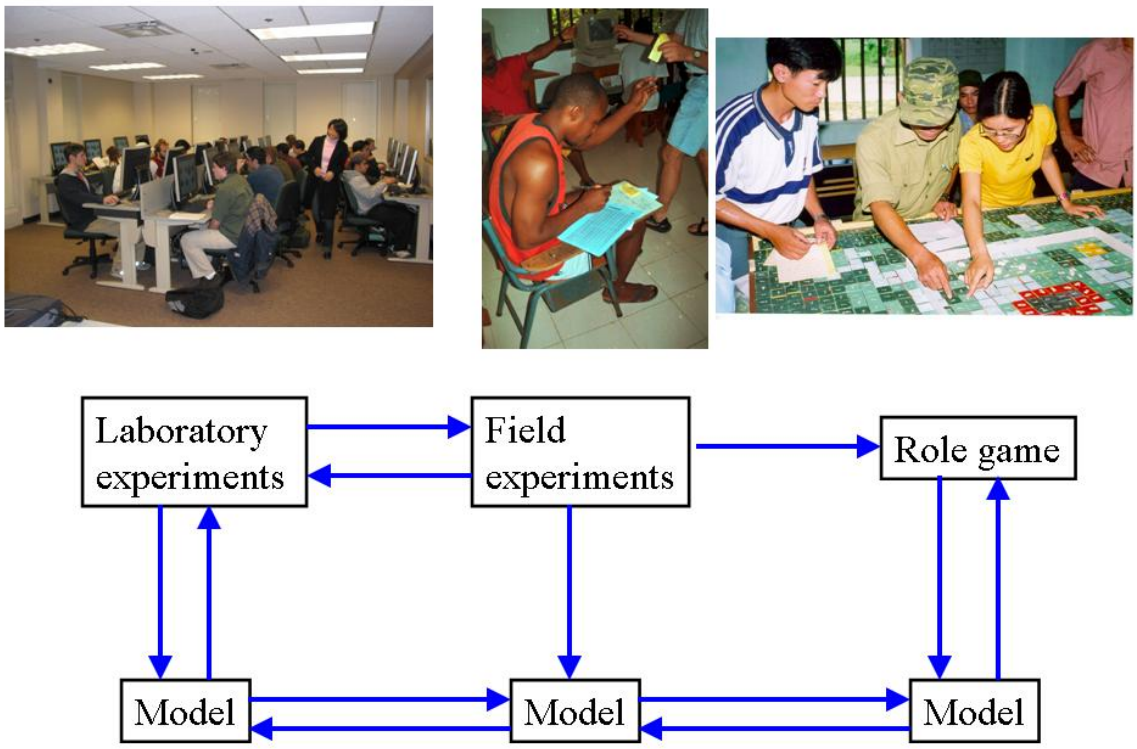

Figure 2: The relation between different types of experiments and the modeling activities.

Based on the experiments in the laboratory and the field, we will develop a software available as downloadable educational tools, with which students all over the world will be able to experiment with rule-crafting in commons dilemmas.

This project will contribute to the methodological development of agent-based models by combining laboratory and field experiments, and role games, and to the empirical testing of alternative behavioral models. It may have a broad impact in political science and ecosystem governance by deriving an understanding of what factors affect the ability of resource users to change institutional rules effectively. The project will strengthen the collaboration on experimental research and agent-based modeling between Asia, Latin American and the USA.

Publications

Goldstone, R.L. and M.A. Janssen (2005), Computational models of collective behaviour, *Trends in Cognitive Science*, in press

Janssen, M.A. (2005), Evolution of Institutional Rules, *Complexity*, in press

Project Website

http://www.public.asu.edu/~majansse/dor/nsfhsd.htm